Do conditional transfers produce an intra-household flypaper effect? Evidence from Bangladesh

Faria Huq
Georgia Southern University

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Introduction

- Conditional transfer programs
  - human capital formation
  - Transfer of cash or food contingent on participation in education or health related programs.
- Food for education (FFE) in Bangladesh
  - Conditional transfer of food to poor families for sending children to primary school in villages in Bangladesh.
  - Later modified to cash transfers instead of food transfers
  - Compensates parents for the high opportunity cost of sending children to school instead of work.

Conditional transfer programs

- Child : intended beneficiary
- Adult : transfer recipient
- Effect of program intervention dependent on intra-household allocation of transfer
  - Theory of altruism: transfer gets redistributed to all family members
  - Flypaper effect: transfer "sticks" to the target

Purpose of this paper

- Does the flypaper effect exist in the FFE/PES case?
- Food or cash: which effect larger?
- Policy implications for designing effective transfer programs.

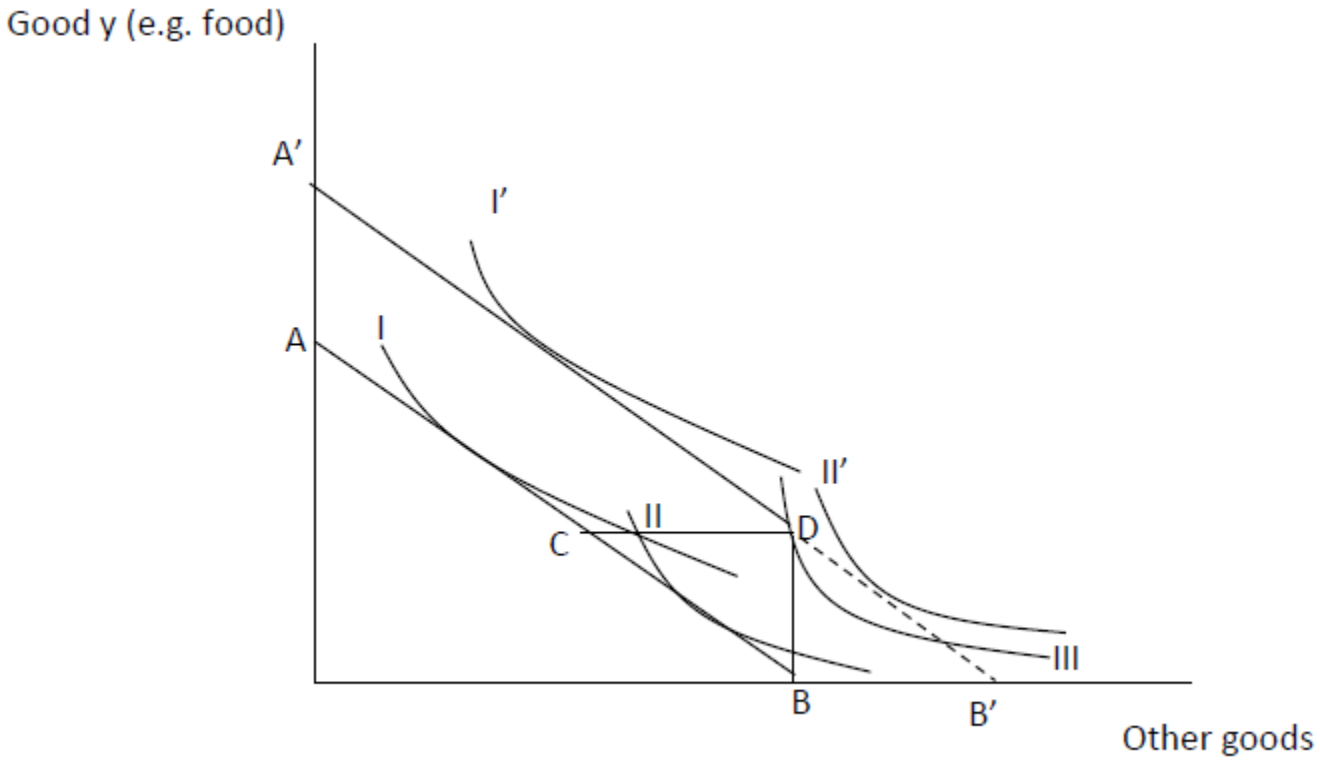
Becker's explanation

- Children in the treatment group generally had larger improvements in nutritional status.
- One possible explanation:
  - Becker (1971)
    - Household members maximize a joint utility function
    - A transfer shifts the budget constraint outwards.
    - The household *moves along the Engel curve*
    - The source of the additional income is irrelevant.
  - Tk. 100 is Tk. 100

Another explanation: Flypaper effect

- Originally from public finance literature
  - Government grants to localities tend to increase local spending by more than an equal increase in local income.
- In development literature
  - Policies 'stick' to the intended target rather than be reallocated e.g. food stamps.
- Changes the shape of the Engel curve.
- Understated treatment effect.

Cash vs. in-kind transfers



Previous Literature

- Paxson and Schady (2010)
  - Flypaper effects influenced how transfers were used in rural Ecuador.
- Shi (2012)
  - Educational fee reductions are matched by increased voluntary educational spending on the same children who receive the fee reductions.
- Kooreman (2000)
  - Labeling a transfer in the Netherlands as a "child benefit" led to housholds spending a disproportionate amount of the tranfer on children's goods.

Description of the program

- Originally Food for Education (FFE)
  - Launched by government of Bangladesh in 1993
  - Primary school grades 1 to 5
  - 20 kg of wheat or 16 kg of rice per month for sending children to school ($3.20)
  - 85% attendance requirement.
  - Covered 1/3 of the unions within the rural upazilas.
- Modified to Primary Education Stipend in 2002 (PES):
  - Cash transfers only ($1.72 a month)
  - Covered all unions

Description of the program

- Selection criteria
  - 2 or 3 unions that were economically disadvantaged and had a low literacy rate were selected from each upazila.
  - Within each union, households with primary school age children became eligible for benefits if one of the following criteria were met:
    - Children from landless or nearly landless household
    - Children of day laborers
    - Children from female headed households
    - Children from households with low income occupations

Data

- Survey conducted by IFPRI and CPRC on both FFE and PES
  - 600 households randomly selected from 60 villages
    - 400 households in FFE unions (treatment group)
    - 200 households in non-FFE unions (control group)
  - Initial survey: 2000, 2003
  - Re-interviewed in 2006/2007 – for long term analysis

Parametric estimation

- Standard food Engel curve linking expenditure on individual goods (food vs. non-food) to total expenditure.
- Based on Working (1943)

$$\omega_i = \alpha + \beta_i \ln(x/n) + \eta_i \ln n + \sum_{j=1}^{J-1} \theta_{ij} \left(n_j / n\right) + \gamma_i' z + u_i$$

where:

ω_i is the share of the budget devoted to food

x is the total expenditure (budget)

n is the household size

n_j is the number of people in the household in the jth category of age classes

z is a vector of socioeconomic variables

Modified version

- In order to incorporate both treatment and comparison groups:

$$\omega_i = \alpha_0 + \alpha_0' T_i + \alpha_1 \ln\left(\frac{x_i}{n}\right)(1 - T_i) + \alpha_1' \left[\ln\left(\frac{x_i + transfer}{n}\right)\right] T_i + \gamma z_i + \varepsilon_i$$

where

ω_i is the share of the budget devoted to food

T_i is an indicator variable which equals 1 if i is in the treatment group and 0 otherwise

x_i / n is per capita expenditure

n is the household size

z_i is a vector of demographic controls that include household size, age, gender and education of head of HH, and number of people in the household in 3 age classes

Two models

- Model 1
  - Household level
  - ω_i is the food share of the budget
- Model 2
  - Individual level
  - ω_i is the nutritional status of the children in the household

Hypotheses

- Null hypothesis: no flypaper effect
  - Treatment effects would be through movements along the Engel curve
  - Expenditure elasticities would be the same for the treatment and the control group
  - Intercepts for the Engel curve should also be the same for the treatment and comparison groups

$$H_0 : \alpha_1 = \alpha_1' \text{ AND } \alpha_0' = 0$$

Descriptive statistics

	Mean	Std. Dev	Min	Max
Household Size	6.22	2.32	2	17
Household Calorie Consumption per day	14,665.88	6429.60	3488.26	61748.20
Household Protein Consumption per day	497.56	247.24	93.04	2072.542
Total expenditure	5026.92	8039.60	687.38	136267.2
Monthly household food expenditure	2679.12	1494.65	490.93	9948.14
Food budget share	0.66	0.18	0.05	0.96
Age of head of household	44.46	10.43	20	82
Gender of head of household (female = 1)	0.08	0.28	0	1
Years of education of head of household	2.76	3.80	0	16
Total number of children below age 5	0.95	0.93	0	5
Total number of children (ages 6 to 12)	1.74	0.85	0	5
Total number of children (ages 13 to 18)	0.85	0.88	0	4

Estimation results

	Model 1 Food share		Model 2 Nutritional Status	
	Food transfer	Cash transfer	Food transfer	Cash transfer
Constant	1.675*** (0.119)	0.769*** (0.044)	-4.855*** (0.686)	-3.830*** (0.625)
Treatment	0.113 (0.133)	0.163** (0.069)	0.289 (0.758)	0.098 (0.063)
Ln (Xi/n)(1-T)	-0.146*** (0.018)	-0.005 (0.006)	0.388*** (0.106)	0.278*** (0.094)
Ln ((Xi+transfer)/n)T	-0.125*** (0.012)	-0.033*** (0.009)	0.216*** (0.068)	0.112 (0.133)
No. of children in age group1 (0 to 5)	-0.021*** (0.006)	-0.030*** (0.005)	-0.060* (0.031)	0.0037 (0.0073)
No. of children in age group2 (6 to 12)	-0.0078 (0.0065)	0.0028 (0.0055)	-0.028 (0.034)	-0.0039 (0.0075)
No. of children in age group3 (13 to 18)	-0.0095 (0.006)	-0.0300 (0.056)	0.055 (0.035)	-0.0039 (0.0074)
Age of head of household	0.0008* (0.0005)	0.0025*** (0.0005)	0.006** (0.003)	0.0009* (0.0005)
Gender of head of household	-0.021 (0.016)	-0.0702*** (0.016)	0.107 (0.102)	0.0123 (0.0179)
Education of head of household (years)	-0.0006 (0.001)	0.0074*** (0.0013)	0.023*** (0.008)	-0.0006 (0.0016)

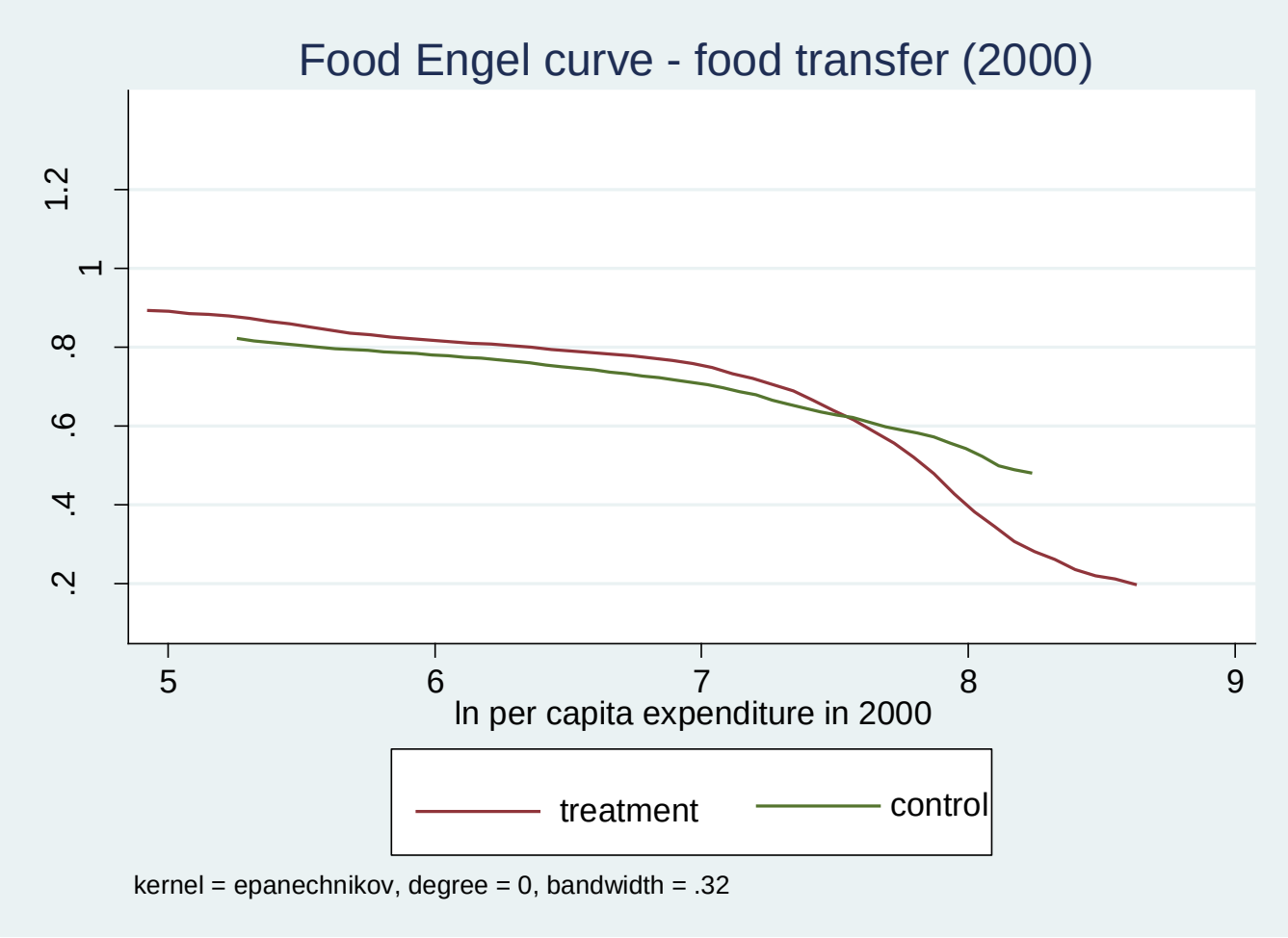
Test of Engel

	Constant	Indicator Treated	Expected ln(pcx)* control	Expected ln(pcx)* treated	Test 1: p-value	Test 2: P-value (joint)
	α_0	α_0'	α_1	α_1'	$\propto_1 = \propto_1'$	$\propto_1 = \propto_1'$, & $\propto_0' = 0$,
			FOOD TRANSFERS (2000)			
HH Level: Food budget share	1.675*** (0.119)	0.113 (0.133)	-0.146*** (0.018)	-0.125*** (0.012)	0.2980	0.0042
Indiv. level: Nutritional Status	-4.855*** (0.686)	0.289 (0.758)	0.388*** (0.106)	0.216*** (0.068)	0.0891	0.0010
			CASH TRANSFERS (2003)			
HH Level: Food budget share	0.769*** (0.044)	0.163** (0.069)	-0.005 (0.006)	-0.033*** (0.009)	0.0122	0.0067
Indiv. level: Nutritional Status	-3.830*** (0.625)	0.098 (0.063)	0.278*** (0.094)	0.112 (0.133)	0.3084	0.5784

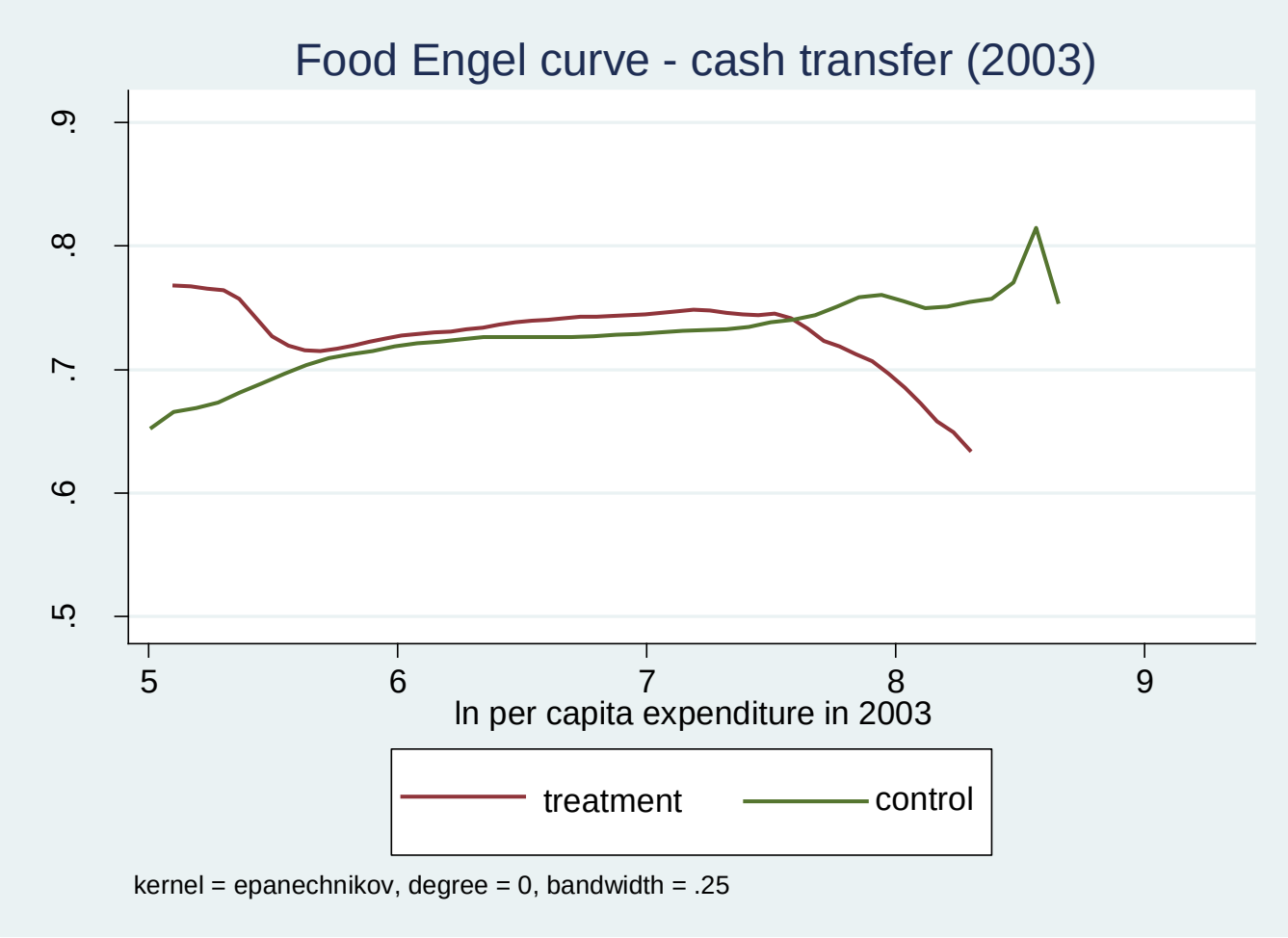
Non parametric estimation

- If no flypaper effect exists:
  - Expect the Engel curve for the treatment group to simply lie on top of the Engel curve for the control group
- If a flypaper effect exists:
  - Expect non parametric Engel curves for households in the treatment group to shift.

Non parametric estimation



Non parametric estimation



Conclusion

- Food transfers
  - Evidence of possible flypaper effect
  - Lower expenditure levels – increase in food share
  - Higher expenditure levels – decrease in food share
- Cash transfers
  - Evidence of possible flypaper effect
  - Lower expenditure levels – large increase in food share
  - Higher expenditure levels – large decrease in food share
- Policy implications – cash transfers more cost effective

Thank you!

Questions/Comments?

E-mail: fariahuq@georgiasouthern.edu

Appendix

Beneficiary perceptions about FFE and PES

Question	Mean	Std Dev
Which is better for your household? FFE wheat or PES cash? (1=wheat, 0=cash)	0.23	0.42
Because a female member was the decision maker regarding the program:		
There was no food shortage (1 = agreed, 0 = not agreed)	0.71	0.46
There was better child nutrition (1 = agreed, 0 = not agreed)	0.68	0.47
There was better girl nutrition (1 = agreed, 0 = not agreed)	0.63	0.48
More cash is needed for requirements (1 = agreed, 0 = not agreed)	0.81	0.39
It is harder to cheat in distributing food then in cash	0.86	0.35
Food was hard to carry, cash is easy to carry	0.87	0.33
There was less pilferage in wheat than in cash	0.10	0.31
For selling difficulty, we had to eat most of the wheat	0.76	0.43
PES cash can be used directly for education, but not FFE wheat	0.89	0.31
Fear of mugging/snatching PES money is higher than FFE wheat	0.16	0.37

Nutritional status

- Measuring nutritional status
  - Height for age (stunting)
    - z-score (normalized measure):

$$z = \frac{X_{i,age} - X_{m,age}}{\sigma_{m,age}}$$

where $X_{i,age}$ is the height of the *i*'th individual at age t
$X_{m,age}$ and $\sigma_{m,age}$ are the median and std. dev. of height for the reference population

- If z=0: average, z<-2: nutritional problem

Prevalance of malnutrition (2000)

	FFE Union		Non-FFE Union	
	Average HAZ	% HAZ <-2	Average HAZ	% HAZ<-2
	FFE Beneficiary households			
All	-2.19	57		
Boys	-2.21	58		
Girls	-2.17	57		
Non beneficiary households with children in school				
All	-1.98	45	-1.93	51
Boys	-1.96	47	-1.69	48
Girls	-2.00	44	-2.25	54
Households with children not attending school				
All	-2.59	68	-2.22	58
Boys	-2.83	79	-2.19	62
Girls	-2.37	57	-2.25	53
All households				
All	-2.20	56	-2.01	53
Boys	-2.25	58	-1.81	52
Girls	-2.15	53	-2.25	54

Source: Chronic poverty and long term impact in Bangladesh, IFPRI, 2000

Note: Unit of observation is a child (0-12 years). HAZ is the height-for-age z-score

Average Treatment effects from PSM

	FFE – not FFE	t-statistic
Nearest neighbor	0.323	2.019
Stratification	0.276	3.026
Kernel density matching		
1. Gaussian	0.220	1.799
2. Epanechnikov	0.351	2.853

Average Treatment effects
Breakdown by occupation of head of household

	FFE – not FFE	t-statistic
Wage labor	0.070	2.159
Salaried	0.214	1.456
Self employed	0.321	1.560
Trader	0.121	2.342
Farming	0.145	1.897

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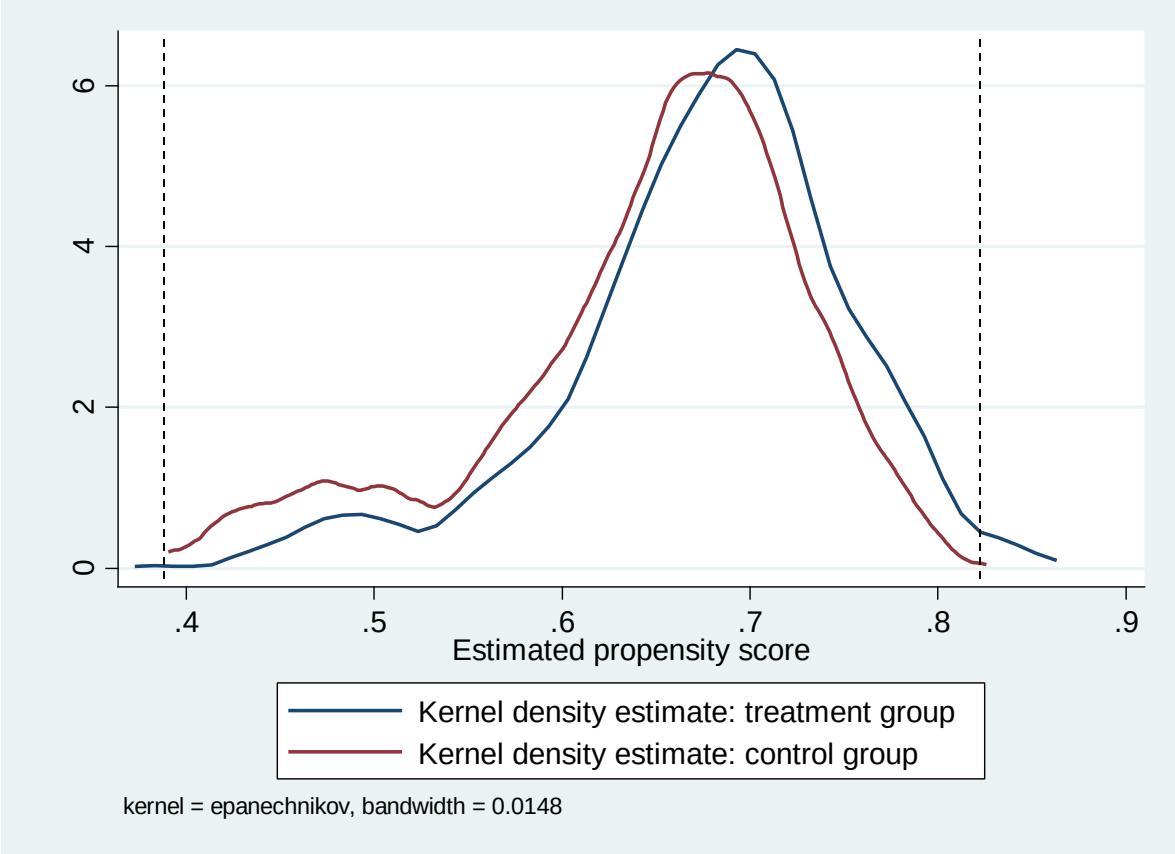
The region of common support



This is the zone where the densities of the propensity scores for participants and non-participants overlap.

Estimation methodology

- z_i^1 : nutritional status of the ith household (beneficiary)
- z_i^0 : nutritional status of the ith household (comparison)
- Impact of the program : $\Delta = z_i^1 - z_i^0$
- Let D = 1 if household receives the program, 0 otherwise
- Average impact (ATT) can be estimated by :

$$E(\Delta | X, D=1) = E(z^1 - z^0 | X, D=1)$$

$$= E(z^1 | X, D=1) - E(z^0 | X, D=1) \qquad (1)$$

where X is a vector of control variables

Estimation methodology

- Problem:

$$E\left(z^0 \middle| X, D=1\right) \text{is not observed}$$

- Solution:
  - Propensity score matching – method for estimating this counterfactual outcome for participants.
  - Let $P(X) = Pr(D=1 \mid X)$ be the probability of participation.
  - PSM matches treatment case with control case with similar values of $P(X)$

Propensity score matching

- Pool both samples (treated and control)
- Estimate a probit model of program participation as a function of pre-treatment variables that might influence participation:

$$P(X)=Pr(D=1 \mid X)$$

- Create propensity score – a summary measure of similarity
- Match every treatment case with a control case using the propensity score
- The impact is the difference between the average z-scores.

Controls

- Child related variables
  - Age, gender, birth order
- Family related variables
  - Parent's anthropometrics, education, work status
- Community variables
  - Source of water, access to electricity, distance from nearest urban area, location dummy